

Appl. № 10/754,800

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AFFIDAVIT

It is well known that the use of ultrasound technology for intrusion detection procedure enables its secrecy and noise immunity, and finally it provides for reliability of intrusion protection of critical objects. The airborne ultrasound attenuates extensively in the ambient air either indoor or outdoor, and narrow-angle ultrasonic beam patterns do not travel around corners well. Thus, the application of ultrasound intrusion detection to the objects that feature the complexity of their layouts and architectural structures is of the present-day challenge.

The ultrasound receivers of CTRL Systems, Inc. (**Hornet, UL101, Next Gen**) have revealed the best remote ability of gas leak detection with respect to the other products on the present-day market as it is shown in **Appendix 1**. The parameters of the said tested leak were smaller in regard to the standard parameters (see **Appendix 2**). Nevertheless, the dead band of 0.04 dB for receiver UL101 could be reached at a distance not more than 100 feet at the nearly normal conditions of the outdoor air ambient (Temperature = 72°F; Relative humidity ≈ 47%; Atmospheric pressure ≈ 29.00 in Hg; Cross wind ≈ 5 mph). Application of UL101 with its performance-enhancing accessory, the parabolic concentrator **Power-Beam 300**, can make the effective distance of ultrasound location nearly three times as much. It means that ultrasonically surveyed the near field zone of more than 100 feet in prevailing direction of location and the circumjacent air vicinity of more than 300 feet in radius of dome-type volumetric room around a protected object must be arranged into the physical, tightly juxtaposed and preferably geometrically closed areas that constitute the spatial multi-echelon openwork structure of the defense-in-depth automatic intrusion protection system. This arrangement dictates looking for innovative approaches to ultrasound location inside every echelon, and also to inter-echelon informational and processing logical interrelation in intrusion detection, justification and prevention procedures. The novel approach must be applied also to procedure of handling the ultrasound signals, acquired during the continuous status scan of ultrasound detectors (i.e. receivers and transceivers), up to the logically correct decision of the goal function of the intrusion detection and protection method. The said goal function consists in creation and presentation of the alarm signals and signals of activating measures of intrusion prevention, protection and defense. The present invention is devoted to resolution of the mentioned above problems of intrusion ultrasound detection and protection of the object that feature complex spatial component layout.


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Appendix 1

P_{leak} 5 psi
 Orifice 92 microns = .092 mm
 Battery - 8.75 V, used same battery for each appropriate device; exceptions SDT 150 and UE2000

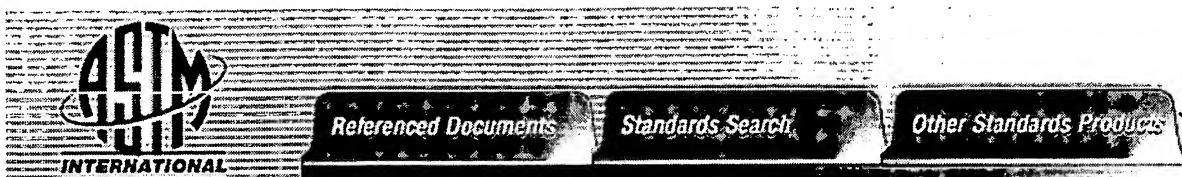
1. Detectability - Ability to both hear distinct signal and see indication of ultrasound on meter.
 It is noted that the sound can be heard further than the ability of the meter to respond.

Sensor	1/2 gain	Full Gain
Hornet	52"	147"
UL101	36"	120"
NextGen*	ND	80"
UL101 Rev B	ND	100"
111R	26"	67"
50"	77"	115"
SDT150	2"	70"
UE2000**	ND	115"
	ND	85"
	ND	88"
	ND	96"
	ND	97"
	ND	98"
	ND	10"
	ND	69"
	ND	42"
	ND	63"
	ND	68"
	ND	70"
	ND	50"
	ND	125"
	ND	140"

2. Identifiable - When a leak can be detected and located without any doubt of the signal being heard.
 This is probably the better test of the two. There is much less subjectivity.

Sensor	Gain	Position	Distance
Hornet	F		65"
UL101	F	3/6	82"
NextGen*		7	180"
UL101 Rev B	F	6	50"
111R	F	max. vol.	51"
SDT150	F	6	37"
UE2000**		9	65"

*Unlike the other devices, the distance measured is both detectable and identifiable because of the NextGen to have such minimal white noise at each gain. There is no half/full gain control.
 **Fixed Frequency bandwidth used, no half/full gain control



Appendix 2

Document Summary

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ACTIVE STANDARD: E1002-05 Standard Test Method for Leaks Using Ultrasonics

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1. Scope

1.1 *Test Method A, Pressurization*— This test method covers procedures for calibration of ultrasonic instruments, location, and estimated measurements of gas leakage to atmosphere by the airborne ultrasonic technique.²

1.2 In general practice this should be limited to leaks detected by two classifications of instruments, Class I and Class II. Class I instruments should have a minimum detectable leak rate of $6.7 \cdot 10^{-7}$ mol/s ($1.5 \cdot 10^{-2}$ std. cm³/s at 0C) or more for the pressure method of gas leakage to atmosphere. Class II instruments should have a minimal detectable leak rate of $6.7 \cdot 10^{-6}$ mol/s ($1.5 \cdot 10^{-1}$ std. cm³/s at 0C) or more for the pressure method of gas leakage to atmosphere. Refer to Guide E 432 for additional information.

1.3 *Test Method B, Ultrasonic Transmitter* For object under test not capable of being pressurized but capable of having ultrasonic tone placed/injected into the test area to act as an ultrasonic leak trace source.

1.3.1 This test method is limited to leaks producing leakage of $6.7 \cdot 10^{-6}$ mol/s ($1.5 \cdot 10^{-1}$ std. cm³/s at 0C) or greater.

1.4 The values stated in SI units are to be regarded as the standard.

1.5 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to consult and establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

[E1316 Terminology for Nondestructive Testing](#)

[E432 Guide for Selection of a Leak Testing Method](#)

[E543 Practice for Agencies Performing Nondestructive Testing](#)

[SNT-TC-1A Recommended Practice for Personnel Qualification and Certification in Nondestructive Testing](#)

[ANSI/ASNT CP-189 ASNT Standard for Qualification and Certification of Nondestructive Testing Personnel](#)

[NAS-410 Certification and Qualification of Nondestructive Personnel](#)

Index Terms

leak detection-ultrasonic; leak testing; leakage rate; ultrasonic detector; 19.100; 19.100

[Citing ASTM Standards](#)

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